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Experiences of Safety-Net Practice Clinicians Participating in the National Health Service Corps During the COVID-19 Pandemic

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Abstract

Objectives: The impact of the COVID-19 pandemic has been particularly harsh for low-income and racial and ethnic minority communities. It is not known how the pandemic has affected clinicians who provide care to these communities through safety-net practices, including clinicians participating in the National Health Service Corps (NHSC).

Methods: In late 2020, we surveyed clinicians who were serving in the NHSC as of July 1, 2020, in 20 states. Clinicians reported on work and job changes and their current well-being, among other measures. Analyses adjusted for differences in subgroup response rates and clustering of clinicians within practices.

Results: Of 4263 surveyed clinicians, 1890 (44.3%) responded. Work for most NHSC clinicians was affected by the pandemic, including 64.5% whose office visit numbers fell by half and 62.5% for whom most visits occurred virtually. Fewer experienced changes in their jobs; for example, only 14.9% had been furloughed. Three-quarters (76.6%) of these NHSC clinicians scored in at-risk levels for their well-being. Compared with primary care and behavioral health clinicians, dental clinicians much more often had been furloughed and had their practices close temporarily.

Conclusions: The pandemic has disrupted the work, jobs, and mental health of NHSC clinicians in ways similar to its reported effects on outpatient clinicians generally. Because clinicians' mental health worsens after a pandemic, which leads to patient disengagement and job turnover, national programs and policies should help safety-net practices build cultures that support and give greater priority to clinicians' work, job, and mental health needs now and before the next pandemic.

Keywords

safety-net practices, primary care, dental and behavioral health clinicians, National Health Service Corps, COVID-19, health care worker management, well-being, education loan repayment

The COVID-19 pandemic has affected all communities in the United States, but infections, deaths, and financial and social disruption have been most severe in low-income, socially vulnerable, and predominantly racial and ethnic minority communities, both rural and urban.[1-7] Consequently, among all outpatient practices, those that serve these communities may have been disproportionately affected, including federally qualified health centers (FQHCs), Indian Health Service (IHS) and tribal health centers, community mental health and drug treatment centers, and other safety-net practices.

Safety-net practices have long been challenged to maintain adequate clinician staffing.[8-10] For many, the loan repayment programs of the National Health Service Corps (NHSC) have provided critical recruitment and retention incentives: 13 000 clinicians currently practicing in safety-net sites receive support from the NHSC.[11-14]

In 2018 and 2019, when thousands of clinicians were contracting with the NHSC for a standard, 2-year initial loan repayment service term, few anticipated that a global pandemic would occur while they served. When the pandemic arrived, NHSC participants found themselves on the frontlines

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of care in many of the nation's hardest-hit communities. For many NHSC clinicians, the pandemic has likely heightened a sense of purpose and meaning in their work. However, like all clinicians, NHSC participants have risked infection through their work, have had to negotiate a shift to virtual care and many other changes in care processes, and have sometimes faced disruptive job changes, such as reduced hours, furloughs, and practice closures.[15-21]

NHSC clinicians are contractually obligated to practice only in approved sites and for a specified minimum number of hours each week, with restrictions on taking leave from their jobs.[22] NHSC service contracts were not designed for the exigencies of a pandemic. The NHSC has helped clinicians reconcile pandemic-related work and job changes with their contract obligations, extending contracts to accommodate periods of work-hour reductions and furloughs, and providing flexibility to allow telework and new temporary work sites.[23]

Experiences during the pandemic have deeply affected clinicians personally and professionally.[21,24-27] Learning more about the pandemic experiences of NHSC participants is important to understanding how this valuable workforce has been affected and to anticipate how their future work and retention in their safety-net sites may be affected.[28-30] The additional $800 million designated for the NHSC in the American Rescue Plan Act of 2021 makes understanding the pandemic's impact on its current participants particularly important.[31]

This study used survey data to characterize the experiences of NHSC participants in 20 states through the pandemic's first 9 months. It also describes their perceived sources of stress during the pandemic and well-being as of 9 months into the pandemic. We contrasted experiences for clinicians in primary care, dental health, and behavioral health disciplines, who by the differing nature of their work and practice settings may be experiencing the pandemic differently.

Methods

In winter 2020, we surveyed all 3886 clinicians who, as of July 1, 2020, were participating in the NHSC's Loan Repayment Program (LRP), Rural Community LRP, Substance Use Disorder Workforce LRP, and Scholarship Program in 20 states (Alaska, Arizona, Arkansas, California, Delaware, Iowa, Kentucky, Minnesota, Missouri, Montana, Nebraska, Nevada, New Mexico, North Carolina, North Dakota, Oregon, Rhode Island, South Carolina, Virginia, and Wyoming).[32] We also surveyed all 377 clinicians participating in joint NHSC–state LRPs in 12 of these 20 states; 3 states do not offer joint NHSC–state LRPs, and we did not have roster data to contact joint NHSC–state LRP participants in 5 states. Together, these 4263 clinicians constituted about one-third of all clinicians serving in the NHSC.[12] The 20 states included in this study participated in the Provider Retention & Information System Management (PRISM) Collaborative (www.3rnet.org/prism), which annually collects questionnaire feedback from clinicians in the NHSC and states' similar programs to assess program outcomes and to know how to better support clinicians.[33] This study drew on the PRISM Collaborative's existing relationships among states, its on-hand roster data for clinicians participating in NHSC and joint NHSC–state programs, and clinicians' familiarity and strong participation in the PRISM Collaborative's questionnaires. One member state did not participate in this COVID-19 study. The 20 participating states did not differ statistically from the 30 other states, in both mean and median total population, per-capita income, percentage population living in urban areas, and number of known positive COVID-19 infections as of December 15, 2020[34-37]; however, only 1 participating state was in the Deep South and only 1 was in New England.

The survey opened on November 24, 2020, and closed on February 7, 2021. Because nearly all NHSC contracts begin and end in the months between July and September, and given this study's July 1 participation eligibility date, a late November survey meant that about half will have recently completed an initial 2-year NHSC or 1-year continuation contract term, and half would have been participating for at least 15 months.

Participant roster data provided for the PRISM Collaborative's ongoing feedback questionnaires by the NHSC and member agencies of the states' PRISM Collaborative were used to identify potential participants and individualize questionnaires. Clinicians were emailed invitations to participate in a voluntary and anonymous study, with links to the online

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questionnaire on the Qualtrics 2020 platform (Qualtrics). They received biweekly reminders. This study was exempted from human subjects review by the Office of Human Research Ethics of the University of North Carolina at Chapel Hill.

Questionnaire

The questionnaire asked clinicians to report on their experiences at their current practices or where they had most recently worked if not currently employed. Clinicians verified that they would be reporting on the practices listed in NHSC and the PRISM Collaborative's state agency records, or they reported the location of a new practice if they had moved.

Questions asked how patients or clients of their practices had been affected in the pandemic, how their daily work and jobs (employment situations) had changed, and their sources of stress, all derived from the many published reports on the pandemic's effects on clinicians and people generally.[18,38-42] We used a 7-item Well-Being Index to assess clinicians' feelings of fatigue, depression, burnout, anxiety/stress, and mental and physical quality of life. This index has been validated as a screening tool for mental distress in both health professionals and non–health care workers, correlating with other validated measures of self-reported quality of life, fatigue, burnout, suicidal ideation, medical errors, and intent to leave one's current job.[43-46] In using the 7-item Well-Being Index, we used the criterion of ≥2 yes responses reflecting negative mental or physical states in the previous month as the threshold level for being at risk for mental distress for US workers generally.[44] One positive item recently added to this index—finding work meaningful—was also queried but analyzed as an individual item.[44] We added a second positive item querying clinicians' sense of accomplishment from their job, adapted from the Minnesota Job Satisfaction scale.[47]

A draft questionnaire received feedback from academic clinicians and workforce researchers in 5 of the surveyed disciplines: medicine, physician assistant, nursing, social work, and psychology. The subsequently revised questionnaire was then pilot tested with 26 NHSC-participating clinicians in 3 states.

Analysis

Item completion rates were >99% for clinicians' descriptions of the pandemic's impact on their work, jobs, stress, and well-being; 89% for reports of having children at home; and >95% for estimates of the pandemic's effects on patients.

We dichotomized Likert-scaled responses to items quantifying the degree of stress perceived from various sources both for ease of visualization and because finding something causes "moderate" stress intuitively seems like an important step up from it causing "minimal" stress, and we conducted statistical comparisons of groups for the dichotomized data. All quantitative analyses incorporated poststratification weights[48] to adjust responses from participants to reflect all surveyed clinicians in the 20 states. Weighting was done by 4 characteristics of clinicians for which response rates meaningfully differed and that we anticipated might be related to clinicians' pandemic experiences: males versus females; behavioral health providers versus primary care and dental health clinicians; respondents currently serving an NHSC contract versus those who recently completed an NHSC contract; and participants of 3 groups of programs, specifically joint NHSC–state LRPs versus Rural Community LRP, Substance Use Disorder LRP, and Scholarship Programs versus the NHSC LRP. Weights for the 21 strata ranged from 0.542 to 1.432, with most large strata having weights near 1.0. The calculated design effect due to weights was 1.042.

With 1 exception, we used SPSS version 26 (IBM Corp) to perform all analyses. Because about half of respondents worked in practices with other respondents, we used the Complex Samples feature of SPSS, which uses an adjusted F statistic, a variant of the second-order Rao–Scott adjusted χ^2, in statistical tests of differences between groups on nominal variables.[49] A false discovery rate–adjusted P value of .05 was set for significance using the Hochberg adjustment through the SAS (SAS Institute, Inc) MULTTEST procedure to account for this study's 45 group comparisons.[50]

Results

Of the 4263 NHSC clinicians surveyed, 1890 (44.3%) responded. Respondents worked in a total of 1294 practices in 20 states. Response rates were significantly higher for behavioral health providers than for primary care and dental health clinicians (49.8% vs 41.9%; $P < .001$); for females than for males (42.9% vs 38.4%; $P = .01$); for participants in the joint NHSC–state LRPs than for participants in the Rural Community LRP, Substance Use Disorder LRP, and Scholarship Programs and for participants in the NHSC LRP (66.0% vs 48.9% vs 40.9%; $P < .001$); and for clinicians midway through NHSC contract periods at the time of the survey than for clinicians who had recently completed a contract (51.9% vs 39.2%; $P < .001$). These subgroup response rate differences were incorporated into poststratification weights.

Clinicians and Their Work Settings

Weighted to reflect all 4263 clinicians surveyed in these 20 states, 76.0% of respondents were serving in the NHSC LRP (Table 1). Among disciplines, nurse practitioners were the most numerous (24.7% of all clinicians), followed by physicians (15.1%) and dentists (12.3%). Most worked in FQHCs (57.5%) and in metropolitan areas (64.5%). Nearly

Table 1. Description of clinicians participating in the National Health Service Corps in 20 states during the COVID-19 pandemic[a]

Characteristic	Respondents	
	No. (unadjusted %) (n = 1890[b])	Weighted %[c]
NHSC program		
LRP	1325 (70.1)	76.0
Rural Community LRP	52 (2.8)	2.3
Scholarship	112 (5.9)	6.0
Substance Use Disorder Workforce LRP	152 (8.0)	6.8
Joint NHSC–state LRP	249 (13.2)	8.8
NHSC status at time of survey		
Contract currently active	1032 (54.6)	48.6
Contract completed since July 1, 2020	858 (45.4)	51.4
Discipline		
Primary care		
Physician	277 (14.7)	15.1
Nurse practitioner	434 (23.0)	24.7
Physician assistant	197 (10.4)	11.3
Other primary care	77 (4.1)	3.5
Dental health		
Dentist	213 (11.3)	12.3
Dental hygienist	38 (2.0)	2.3
Behavioral health		
Licensed clinical social worker	234 (12.4)	11.1
Licensed professional counselor	217 (11.5)	10.3
Psychologist	94 (5.0)	4.7
Other behavioral health	109 (5.8)	4.7
Type of practice site		
FQHC–CHC	1046 (55.3)	57.5
Mental health or SUD facility	248 (13.1)	11.7
IHS or tribal site	225 (11.9)	12.0
Rural health clinic	105 (5.6)	5.4
Correctional facility	42 (2.2)	2.0
Other office-based site	201 (10.6)	10.4
Hospital-based site	23 (1.2)	1.0
Rural/urban[d]		
Metropolitan	1212 (64.1)	64.5
Micropolitan	345 (18.3)	18.1
Nonmetropolitan	332 (17.6)	17.3
Sex		
Female	1422 (75.2)	74.3
Male	468 (24.8)	25.7
Age, y		
≤34	560 (29.8)	29.7
35-39	513 (27.3)	27.2
40-49	525 (27.9)	28.1
≥50	281 (15.0)	14.9
Has children at home		
Yes	956 (57.0)	57.0
No	720 (43.0)	43.0

(continued)

Table 1. (continued)

Characteristic	Respondents	
	No. (unadjusted %) (n = 1890[b])	Weighted %[c]
Is or lives with person at high risk for COVID-19 complications		
Yes	755 (40.0)	39.7
No	1132 (60.0)	60.3

Abbreviations: FQHC–CHC, Federally Qualified Health Center–Community Health Center; IHS, Indian Health Service; LRP, Loan Repayment Program; NHSC, National Health Service Corps; SUD, substance use disorder.
[a]Clinicians serving in the NHSC as of July 1, 2020, in 20 states were surveyed by the authors in late 2020.
[b]Because of missing values, counts do not total to 1890 for the variables age, children at home, rural/urban location, and at high risk for COVID-19 complications. Percentages may not add to 100 because of rounding.
[c]Weighted for group response rate differences by sex, discipline group, whether clinicians were currently serving versus recently completed NHSC contracts, and specific NHSC program.
[d]Based on March 2020 core based statistical areas from the US Office of Management and Budget (https://www.census.gov/geographies/reference-files/time-series/demo/metro-micro/delineation-files.html).

three-quarters were female (74.3%), and most reported having children at home (57.0%).

Pandemic's Perceived Effects on Patients/Clients

About half of clinicians overall and also within each of the primary care, dental health, and behavioral health groups reported that the pandemic was adversely affecting the physical health of at least half of the patients/clients (Table 2). More than three-quarters of clinicians (83.0%) reported similar adverse effects on the mental health of half or more of their patients/clients. Behavioral health practitioners almost universally saw such an impact (92.8%) and were also most likely to report their clients had increased use of alcohol or abused substances. Three-quarters of clinicians reported that the pandemic had adversely affected the financial situations of half or more of their patients/clients.

Changes in NHSC Clinicians' Work During the Pandemic

The pandemic had affected the work of most NHSC clinicians (Table 2). Nearly two-thirds reported periods of at least 4 weeks when in-office patient visits fell by more than half from the previous year, while nearly one-quarter reported a period when in-office visits increased more than 25%. Nearly two-thirds also reported a period when at least half of their daily visits occurred by telephone or telehealth, nearly one-quarter reported the scope of their work was significantly narrowed, and 42.7% reported that the location of their work was changed.

Among the discipline groups, dental health clinicians were most likely to have experienced changes to their work, including 83.5% who reported declines in office visit numbers by more than half and 86.5% whose scope of care narrowed. Behavioral health practitioners were most likely to report that most visits occurred by telehealth or telephone (86.0%) and least likely to have their scope of work narrowed (15.5%).

Changes to NHSC Clinicians' Jobs During the Pandemic

Far fewer NHSC clinicians reported changes to their jobs, such as in their work hours and pay, than changes in their work activities (Table 2). About 1 in 6 reported a reduction in paid work hours, a reduction in salary or benefits, or a temporary practice closure. A similar number reported a salary increase. Nearly 1 in 10 was furloughed, and very few reported that their practices closed permanently (1.7%) or that they were laid off (2.4%).

Many more dental clinicians reported changes to their jobs than other groups: about 40% had paid work hours reduced, had been furloughed, or had practices closed temporarily.

Protections and Resources Provided by Practices

Most NHSC clinicians reported that their practices provided them with free COVID-19 testing, and about half were allowed to work at least partially from home (Table 2). Fewer had the option to move to low-risk work areas if they were in a COVID-19 high-risk group (43.7%). Few received free medical care if infected with COVID-19 or assistance with childcare and its costs.

Across the groups, dental health clinicians least often could work from home (22.0%) or move to a lower-risk work area (18.3%), whereas more behavioral health providers could do both.

Table 2. Percentage of clinicians participating in the National Health Service Corps in 20 states reporting various effects of the COVID-19 pandemic on patients, changes in their work and jobs, and supports received from their practices[a]

Item	All NHSC clinicians (n = 1890)	Clinician subgroups			
		Primary care (n = 985)	Dental health (n = 251)	Behavioral health (n = 654)	Adjusted *P* value[b]
Effects on patients/clients: percentage of clinicians who reported at least half of patients/clients were affected					
Physical health	50.8	53.7	48.7	46.3	.03
Mental health	83.0	82.0	65.3	92.8	<.002
Use of alcohol or drugs	36.8	31.9	33.5	47.1	<.002
Financial situations	76.0	75.7	75.1	76.9	.86
Work changes (for ≥4 weeks)					
In-office patient/client visit numbers decreased >50%	64.5	62.3	83.5	59.6	<.002
In-office patient visit numbers increased >25%	23.3	24.7	12.1	26.0	<.002
≥50% of your total daily patient visits occurred by telephone and/or telehealth	62.5	59.4	24.0	86.0	<.002
Scope of work significantly narrowed (ie, limited to emergency care or hospital work)	27.6	18.6	86.5	15.5	<.002
Your organization confine[d] the location of your work to one site, expanded it to a new site, or moved it to a different site	42.7	37.1	54.1	47.3	<.002
Job changes (for ≥4 weeks)					
Paid daily work hours reduced	13.9	9.6	40.1	9.0	<.002
Salary or benefits reduced	16.3	14.7	30.7	12.6	<.002
Salary increased, perhaps for hazard pay	13.3	15.3	13.2	9.6	.02
Temporarily laid off (furloughed)	9.3	3.5	40.1	5.0	<.002
Permanently laid off	2.4	1.9	6.9	1.2	<.002
Practice closed temporarily ≥4 weeks	14.9	10.5	42.5	9.8	<.002
Practice/clinic closed permanently	1.7	1.1	4.4	1.5	.002
Protections and resources provided					
Free COVID-19 testing	70.5	75.5	72.4	60.3	<.002
Free medical care if infected with COVID-19	22.5	24.9	30.6	14.5	<.002
Option to work at least partially from home	55.0	49.4	22.0	80.1	<.002
Resources needed to work from home, like a computer or broadband connection	46.7	43.5	22.1	63.1	<.002
Option to move to low-risk work area if in a high-risk group for COVID-19 complications	43.7	42.0	18.3	59.2	<.002
Expanded assistance with childcare and costs	14.1	14.4	14.4	13.3	.88
Stress management program or resources	48.3	47.3	55.1	47.2	.14

Abbreviation: NHSC, National Health Service Corps.

[a]Clinicians serving in the NHSC as of July 1, 2020, in 20 states were surveyed by the authors in late 2020.

[b]Determined by second-order Rao–Scott adjusted χ^2 test. False discovery rate–adjusted *P* value to account for the study's multiple comparisons, with $P < .05$ considered significant.

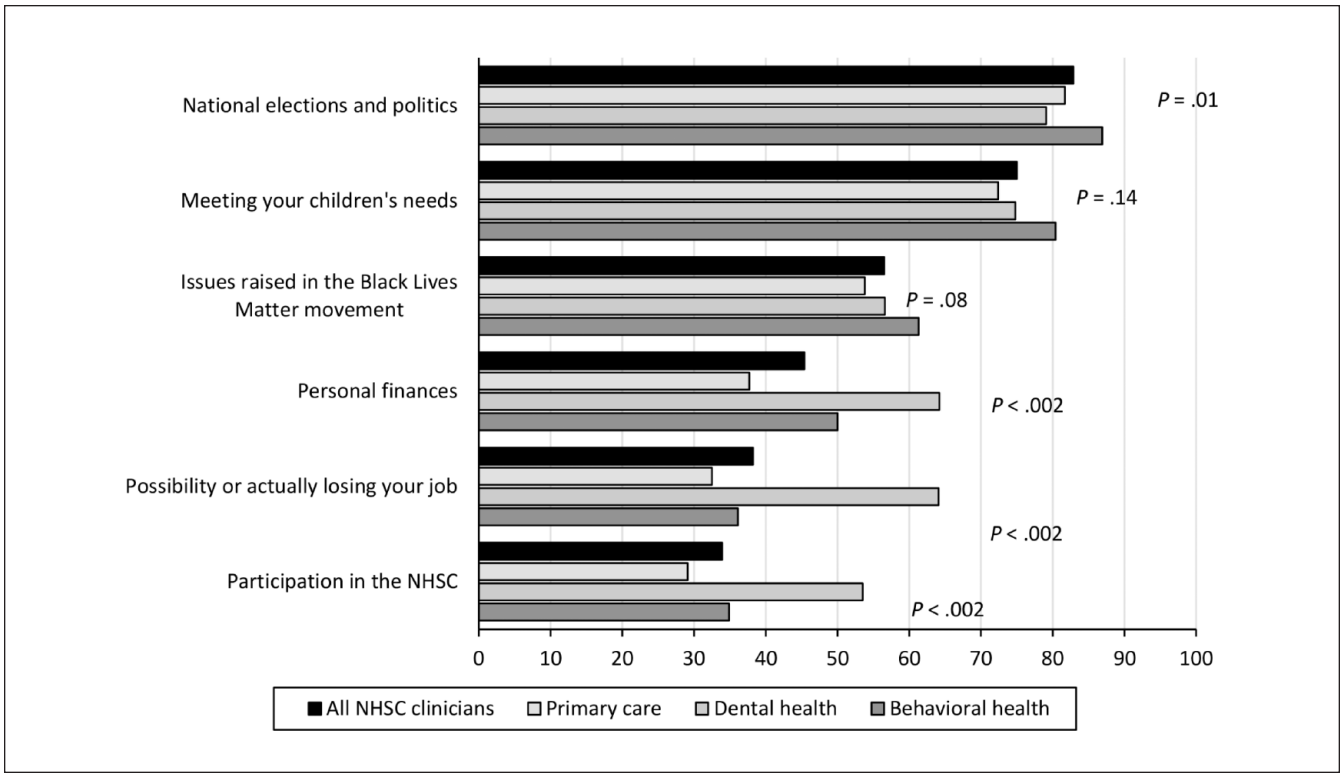

Figure. Weighted percentage of NHSC clinician–participants in 20 states (n = 1890) who reported moderate or severe stress (vs no stress or minimal stress) from various sources during the COVID-19 pandemic. Data for "meeting your children's needs" were based only on clinicians who reported having children at home. Item on participation in the NHSC was added late to the questionnaire; percentages were based on data available from 580 subsequent respondents. Weighted for group response rate differences by sex, discipline group, whether clinicians were currently serving versus recently completed NHSC contracts, and specific NHSC program. False-discovery rate–adjusted *P* value used to account for the study's multiple comparisons, with $P < .05$ considered significant. Abbreviation: NHSC, National Health Service Corps.

Perceived Sources of Stress

The national elections and politics were reported as a moderate or severe stressor by more clinicians—about 80%than the other 5 potential sources of stress queried (Figure). Among clinicians with children at home, nearly as many reported moderate or severe stress meeting their children's needs (75.0%), and 56.5% of all clinicians reported such stress from the issues highlighted by the Black Lives Matter movement. Fewer than half reported moderate or severe stress regarding their personal finances and from potential or actual job loss, and one-third reported moderate or severe stress related to their NHSC participation.

Dental practitioners most often reported moderate or severe stress from the possibility of or actually losing their jobs (64.1%), personal finances (64.2%), and their NHSC participation (53.5%).

Well-Being

Three-quarters (76.6%) of all NHSC clinicians had a Well-Being Index value ≥2 (indicating being at risk for mental distress); this percentage was lower (66.8%) among dental clinicians (Table 3). Among the component items of this index, 75.9% reported feeling burned out from their work; 66.2% reported being bothered by emotional problems such as feeling anxious, depressed, and irritable; 61.2% worried that work was hardening them emotionally; and 47.3% felt bothered by emotional problems such as feeling down, depressed, or hopeless. Among the 3 discipline groups, dental clinicians were least likely to respond yes on 5 of the items.

On the positive side, 84.0% of NHSC clinicians reported that they found work meaningful during the previous month, and 71.6% reported that they were satisfied or very satisfied with feelings of accomplishment in their work during the pandemic.

Changes in NHSC Contracts Because of the Pandemic

We asked clinicians about specific changes made in their NHSC contracts "because of the pandemic and its disruptions to patient/client care." Contract extensions were the

Table 3. Percentage of clinicians participating in the National Health Service Corps in 20 states reporting various mental health states at 9-11 months into the COVID-19 pandemic[a]

Item	All NHSC clinicians (n = 1890)	Clinician subgroups			
		Primary care (n = 985)	Dental health (n = 251)	Behavioral health (n = 654)	Adjusted *P* value[b]
Well-Being Index ≥2, on a 7-item scale[c]	76.6	77.4	66.8	79.6	<.002
Well-being Index items: During the past month have you . . .					
Felt burned out from your work?	75.9	77.7	64.6	78.0	<.002
Worried that your work is hardening you emotionally?	61.2	65.4	54.2	57.0	<.002
Been bothered by feeling down, depressed, or hopeless?	47.3	46.5	41.2	51.8	.02
Have you felt that all things you had to do were piling up so high that you could not overcome them?	40.6	41.9	31.4	42.7	.006
Been bothered by emotional problems (such as feeling anxious, depressed, or irritable)?	66.2	64.3	60.7	72.1	.002
Has your physical health interfered with your ability to do your daily work at home and/or away from home?	18.2	17.0	18.5	20.2	.32
Fallen asleep while stopped in traffic or driving?	3.1	3.5	3.7	2.1	.30
Finds work is meaningful during past month[d]	84.0	83.6	84.0	84.8	.86
Satisfied with the feeling of accomplishment from work during the pandemic[e]	71.6	71.1	75.7	70.5	.34

Abbreviation: NHSC, National Health Service Corps.
[a]Clinicians serving in the NHSC as of July 1, 2020, in 20 states were surveyed by the authors in late 2020.
[b]Determined by second-order Rao–Scott adjusted χ^2 test. False-discovery rate–adjusted *P* value to account for the study's multiple comparisons, with $P < .05$ considered significant.
[c]≥2 yes responses reflecting negative mental or physical states in the previous month used as threshold level for being at risk for mental distress.[45]
[d]Responses of "agree," "strongly agree," or "very strongly agree" vs "neither agree nor disagree," "disagree," "strongly disagree," or "very strongly disagree."
[e]Responses of "satisfied," "very satisfied," or "extremely satisfied" vs "not satisfied" or "somewhat satisfied."

most common changes reported (16.9%), followed by temporary contract suspensions (5.6%) (Table 4). Only 0.3% reported that their contracts were closed early. Dental clinicians reported far more changes in their NHSC contracts.

Discussion

The experiences of clinicians serving in the NHSC during the COVID-19 pandemic likely differ greatly from all previous NHSC cohorts during the program's nearly 50 years. Many experienced periods when patient numbers fell by more than half, most visits occurred virtually, in-person work was relocated, and the services they provided were restricted. Some of these changes violated the terms of their NHSC contracts, which were accommodated by contract amendments for 1 in 5 participants, most often to extend end dates. We cannot know if these work changes differed in magnitude or duration from those of outpatient clinicians generally, because available data for other clinician groups are available only for specific weeks or months during the pandemic, and measures have lacked standard definitions and instruments.[15,40,42,51-53]

The employment situations of this study's NHSC participants in primary care and behavioral health disciplines were

Table 4. Percentage of clinicians participating in the National Health Service Corps in 20 states reporting various changes to their NHSC contracts because of the COVID-19 pandemic[a]

Item	All NHSC clinicians (n = 1890)	Clinician subgroup			
		Primary care (n = 985)	Dental health (n = 251)	Behavioral health (n = 654)	Adjusted *P* value[b]
Because of the pandemic and its disruptions to patient/client care, was your NHSC[c] contract . . .					
End-date extended?	16.9	12.0	49.4	10.4	<.002
Changed from full-time to part-time?	1.0	1.0	1.9	0.7	.37
Officially relocated to a new site?	3.6	4.0	7.0	1.4	<.002
Temporarily suspended?	5.6	2.6	24.2	2.3	<.002
Permanently suspended early?	0.3	0.3	0.4	0.2	.75
Overall, ≥1 reported contract change	17.9	14.0	50.2	11.1	<.002

Abbreviation: NHSC, National Health Service Corps.

[a]Clinicians serving in the NHSC as of July 1, 2020, in 20 states were surveyed by the authors in late 2020.

[b]Determined by second-order Rao–Scott adjusted χ^2 test. False-discovery rate–adjusted *P* value to account for the study's multiple comparisons, with $P < .05$ considered significant.

[c]In the questionnaire, clinicians were presented with the name of their NHSC program.

generally unaffected during the pandemic. Relatively few reported reductions in hours or salaries or temporary practice closures, and very few reported furloughs, permanent layoffs, or permanent practice closures. Reported employment for clinicians working in FHQCs and in outpatient practices generally was similarly only occasionally affected by the pandemic.[18,42,54]

As it has for dentists generally and dentists working in public health settings,[53] the COVID-19 pandemic has been particularly hard on both the work *and* employment of dental participants of the NHSC. In this study, they were 4 times more likely than primary care and behavioral health participants to have their scope of care narrowed, practices closed temporarily and permanently, paid daily work hours reduced, and their NHSC contracts consequently amended. Not surprisingly, dental participants much more frequently reported moderate or severe stress about losing their jobs, personal finances, and their NHSC participation.

The most widely perceived stressors for this study's NHSC clinicians were the fall 2020 national elections and politics, the issues of the Black Lives Matter movement, and meeting children's needs among clinicians with children. These have been ubiquitous stressors in the United States during the pandemic and are generally unrelated to clinicians' work and NHSC participation.

Overall, three-quarters (76.6%) of this study's NHSC participants responded yes to ≥2 of the 7 questions of the Well-Being Index, a useful threshold for identifying people who also report lower quality of life, fatigue, burnout, medical errors, career dissatisfaction, and intent to leave their current jobs.[44-46] This percentage exceeds the 56.4% of a national physician sample in 2011 that similarly responded yes to ≥2 questions on this index, as well as the 50.9% of a probability sample of the US population in 2014 who did so.

Previous pandemics have also had various positive psychological effects on clinicians, including heightened appreciation for the meaning and importance of their work.[55,56] Eighty-four percent of this study's NHSC clinicians reported finding work meaningful in the preceding month—at the highest peak to date in the COVID-19 pandemic nationally—and 72% were satisfied with their feelings of accomplishment from work during the pandemic.

Pandemic-related federal assistance to safety-net practices has helped them with finances, reporting requirements, capacity for telehealth, and COVID-19 screening and vaccination.[57-60] We are unaware of resources or guidance provided to safety-net practices to help them better support clinicians and other staff members and unaware of federal resources provided directly to these clinicians to help them in their work or personally. Neglecting the needs of frontline health care workers, labeled the "stoic approach" to health care workforce management within organizations during the pandemic,[61] has left NHSC participants and other clinicians in safety-net practices relying solely on what their typically

small and tightly resourced practices could offer. Half of this study's NHSC clinicians had no option to work from home or move to a low-risk area, half had no help in stress management, and few had assistance with childcare.

As seen consistently for clinicians following previous coronavirus, HIV/AIDS, Ebola, and other epidemics, the most important long-term impact of the COVID-19 pandemic will likely be on clinicians' mental health. Studies conducted up to 3 years following earlier pandemics have documented persistent stress, anxiety, psychological distress, posttraumatic stress disorder, burnout, and worsened depression.[55,62-64] These mental states for clinicians are known to correlate with their disengagement from patients, medical errors, and job turnover,[65-67] which are particularly costly for safety-net practices. Because of the pandemic's disruptions and its effects on clinicians' mental health, the retention of this cohort of NHSC participants will likely suffer.[28-30]

It may or may not be too late in this pandemic to create programs to help safety-net clinicians mentally handle peak work demands and the many work changes, stresses, and fears with patient care. Advocated strategies are to create the absolute safest working environment possible—prioritizing staff member needs along with patient needs—and to promote social supports, acknowledge stressors, reduce stigma, build cognitive–behavioral and active coping skills, screen frequently for depression, and provide ready access to professional care.[68-73] Other pandemics will come in the future, and it is critical beforehand to establish programs that support staff and a culture of organizational justice, particularly in listening to staff and giving importance to their needs related to work, work–life balance, and mental health.[15,61,62,74]

Limitations

This study's 44.3% response rate is typical for clinician surveys[75,76] but can invite response bias. The pandemic experiences of NHSC participants in these 20 states may not reflect experiences in all states. We presented findings for clinicians in 3 broad fields, which may overlook important differences among disciplines within each field.[77] Twenty-five clinicians (1.3% of all respondents) completed NHSC service contracts before the survey and had since relocated and reported on their experiences in new practices, which may be better than where they worked in the NHSC and which they had elected to promptly leave.

If resurveyed now (fall 2021), 9 months later and 18 months into the pandemic, the number of NHSC clinicians who would report a decrease in outpatient visit numbers, practice closures, and furloughs at any point during the pandemic might be about the same as reported in this study because work and job changes for outpatient clinicians were greatest during the pandemic's first 6 months.[38,41,78] But more clinicians now might report poor well-being, stress, depression, and burnout because of the pandemic's prolonged course and its ongoing challenges for clinicians.

Conclusions

Like the US health care workforce generally, clinicians working in safety-net practices, including those participating in the NHSC, have been managed during the pandemic as a resource to be deployed where needed and replaced when sick.[79] In general, clinicians have willingly complied from a sense of duty to patients, society, and practices, as well as their need for work.

NHSC participants have experienced personal risks, disruptions in their work and, for dental clinicians, disruptions in their employment. At 9 months into the pandemic, three-quarters scored in at-risk levels on their well-being. Like other people in the United States, they have been stressed by the needs of their families, politics, and other national social issues. Based on studies after other epidemics, we should anticipate that their mental health will worsen during the next few years, likely affecting their ability to meet their patients' needs and their decisions about whether to remain in their practices. To help current as well as future NHSC participants whom safety-net practices will rely on in the next pandemic, legislators and agency administrators should create programs and policies to build a culture within safety-net practices of listening to, caring for, and supporting clinicians and staff, and that supports their mental health.

Declaration of Conflicting Interests

The authors declared the following potential conflicts of interest with respect to the research, authorship, and/or publication of this article: R.G.S., M.O., and J.N.H. work in public agencies that operate or are affiliated with joint National Health Service Corps state loan repayment programs that are included in this study.

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References

1. Freese KE, Vega A, Lawrence JJ, Documet PI. Social vulnerability is associated with risk of COVID-19 related mortality in U.S. counties with confirmed cases. *J Health Care Poor Underserved*. 2021;32(1):245-257. doi:10.1353/hpu.2021.0022
2. Lee FC, Adams L, Graves SJ, et al. Counties with high COVID-19 incidence and relatively large racial and ethnic minority populations—United States, April 1–December 22, 2020. *MMWR Morb Mortal Wkly Rep*. 2021;70(13):483-489. doi:10.15585/mmwr.mm7013e1
3. Yancy CW. COVID-19 and African Americans. *JAMA*. 2020;323(19):1891-1892. doi:10.1001/jama.2020.6548
4. Bhala N, Curry G, Martineau AR, Agyemang C, Bhopal R. Sharpening the global focus on ethnicity and race in the time of COVID-19. *Lancet*. 2020;395(10238):1673-1676. doi:10.1016/S0140-6736(20)31102-8
5. Karpman M, Gonzalez D, Kenney GM. Parents are struggling to provide for their families during the pandemic. Material hardships greatest among low-income, Black, and Hispanic parents. Urban Institute. May 2020. Accessed April 26, 2021. https://www.urban.org/research/publication/parents-are-struggling-provide-their-families-during-pandemic?utm_source=urban_researcher&utm_medium=email&utm_campaign=covid_parents&utm_term=lhp
6. Ahmed SM, Shah RU, Fernandez V, et al. Robust testing in outpatient settings to explore COVID-19 epidemiology: disparities in race/ethnicity and age, Salt Lake County, Utah, 2020. *Public Health Rep*. 2021;136(3):345-353. doi:10.1177/0033354920988612
7. Arrazola J, Masiello MM, Joshi S, et al. COVID-19 mortality among American Indian and Alaska Native persons—14 states, January–June 2020. *MMWR Morb Mortal Wkly Rep*. 2020;69(49):1853-1856. doi:10.15585/mmwr.mm6949a3
8. National Association of Community Health Centers. Staffing the safety net: building the primary care workforce at America's health centers. March 2016. Accessed June 1, 2021. http://nachc.org/wp-content/uploads/2015/10/NACHC_Workforce_Report_2016.pdf
9. US Government Accountability Office. Indian Health Service: agency faces ongoing challenges filling provider vacancies. GAO-18-580. August 15, 2018. Accessed April 25, 2021. https://www.gao.gov/products/gao-18-580#summary
10. US Department of Justice, Office of the Inspector General. Review of the Federal Bureau of Prisons' medical staffing challenges. March 28, 2016. Accessed June 1, 2021. https://oig.justice.gov/reports/review-federal-bureau-prisons-medical-staffing-challenges
11. US Department of Health and Human Services, Health Resources & Services Administration. National Health Service Corps. Accessed April 25, 2021. https://nhsc.hrsa.gov
12. US Department of Health and Human Services, Health Resources & Services Administration. Report to Congress: National Health Service Corps for the year 2019. Accessed April 24, 2021. https://bhw.hrsa.gov/sites/default/files/bureau-health-workforce/about-us/reports-to-congress/nhsc-report-congress-2019.pdf
13. New York State Health Foundation. FQHC utilization of state and federal loan and scholarship programs to support clinician recruitment. August 30, 2017. Accessed June 1, 2021. https://nyshealthfoundation.org/resource/fqhc-utilization-of-state-and-federal-loan-and-scholarship-programs
14. Han X, Pittman P, Erikson C, Mullan F, Ku L. The role of the National Health Service Corps clinicians in enhancing staffing and patient care capacity in community health centers. *Med Care*. 2019;57(12):1002-1007. doi:10.1097/MLR.0000000000001209
15. Madara J, Miyamoto S, Farley JE, et al. Clinicians and professional societies COVID-19 impact assessment: lessons learned and compelling needs. *NAM Perspectives*. 2021. doi:10.31478/202105b
16. National Association of Community Health Centers. The Health Center Program and increasing access to comprehensive care through the use of telehealth: an update during COVID-19. June 2020. Accessed April 24, 2021. https://www.nachc.org/wp-content/uploads/2020/06/Telehealth-FS-2020-BPHC-Final.pdf
17. National Association of Community Health Centers. Health centers responding to COVID-19: 1 year review. April 2021. Accessed April 24, 2021. https://www.nachc.org/research-and-data/health-centers-responding-to-covid-19-1-year-review
18. The Physicians Foundation. 2020 Survey of America's Physicians: COVID-19 impact edition. August 2020. Accessed April 26, 2021. https://physiciansfoundation.org/wp-content/uploads/2020/08/20-1278-Merritt-Hawkins-2020-Physicians-Foundation-Survey.6.pdf
19. O'Leary ST, Cataldi J, Lindley MC. US primary care providers' experiences and practices related to routine pediatric vaccination during the COVID-19 pandemic. Centers for Disease Control and Prevention. Updated March 23, 2021. Accessed April 26, 2021. https://www.cdc.gov/vaccines/hcp/pediatric-practices-during-COVID-19.html
20. Coulthard P. Dentistry and coronavirus (COVID-19)—moral decision-making. *Br Dent J*. 2020;228(7):503-505. doi:10.1038/s41415-020-1482-1
21. Moreno C, Wykes T, Galderisi S, et al. How mental health care should change as a consequence of the COVID-19 pandemic. *Lancet Psychiatry*. 2020;7(9):813-824. doi:10.1016/S2215-0366(20)30307-2
22. US Department of Health and Human Services, Health Resources & Services Administration. How to comply with NHSC loan repayment program service requirements. Accessed April 26, 2021. https://nhsc.hrsa.gov/loan-repayment/lrp/service-requirements.html
23. US Department of Health and Human Services, Health Resources & Services Administration. National Health Service Corps and Nurse Corps: coronavirus (COVID-19) frequently asked questions. Updated November 5, 2020. Accessed April 25, 2021. https://nhsc.hrsa.gov/coronavirus/faqs
24. Young KP, Kolcz DL, O'Sullivan DM, Ferrand J, Fried J, Robinson K. Health care workers' mental health and quality of life during COVID-19: results from a mid-pandemic, national survey. *Psychiatr Serv*. 2021;72(2):122-128. doi:10.1176/appi.ps.202000424

25. Fish JN, Mittal M. Mental health providers during COVID-19: essential to the US public health workforce and in need of support. *Public Health Rep*. 2021;136(1):14-17. doi:10.1177/0033354920965266
26. Baptista S, Teixeira A, Castro L, et al. Physician burnout in primary care during the COVID-19 pandemic: a cross-sectional study in Portugal. *J Prim Care Community Health*. 2021;12:215013272110084. doi:10.1177/21501327211008437
27. American Organization for Nursing Leadership and Joslin Marketing. Longitudinal study report: nurse leaders' top challenges and areas for needed support, July 2020 to February 2021. March 10, 2021. Accessed May 12, 2021. https://www.aonl.org/system/files/media/file/2021/03/AONL-COVID19-Longitudinal-Study-Written-Report-03292021.pdf
28. Negrusa S, Ghosh P, Warner JT. Provider retention in high need areas: final report. Report prepared by The Lewin Group, Inc, for the Assistant Secretary for Planning and Evaluation. December 21, 2014. Accessed April 24, 2021. https://aspe.hhs.gov/pdf-report/provider-retention-high-need-areas
29. Negrusa S, Hogan P, Ghosh P, Watkins L. National Health Service Corps—an extended analysis. Report prepared by The Lewin Group, Inc, for the Assistant Secretary for Planning and Evaluation. September 27, 2016. Accessed June 1, 2021. https://aspe.hhs.gov/pdf-report/national-health-service-corps-extended-analysis
30. Pathman DE, Konrad TR, Schwartz R, Meltzer A, Goodman C, Kumar J. Evaluating retention in BCRS programs: final report. Prepared for the Bureau of Clinician Recruitment and Service, National Health Service Corps; March 30, 2012. Accessed April 24, 2021. https://www.shepscenter.unc.edu/product/evaluating-retention-bcrs-programs-final-report
31. American Rescue Plan Act of 2021, HR 1319, S 2602, 117th Congress. Funding for National Health Service Corps. 2021. Accessed April 24, 2021. https://www.congress.gov/bill/117th-congress/house-bill/1319/text
32. US Department of Health and Human Services, Health Resources & Services Administration. Loan repayment. Accessed June 7, 2021. https://nhsc.hrsa.gov/loan-repayment/index.html
33. Rauner T, Fannell J, Amundson M, Harrison JN, Sauer M, Pathman DE. Partnering around data to address clinician retention in loan repayment programs: the Multistate/NHSC Retention Collaborative. *J Rural Health*. 2015;31(3):231-234. doi:10.1111/jrh.12118
34. US Census Bureau. 2020 population and housing state data. August 12, 2021. Accessed August 17, 2021. https://www.census.gov/library/visualizations/interactive/2020-population-and-housing-state-data.html
35. US Bureau of Economic Analysis. Personal income summary: personal income, population, per capita personal income. 2018. Accessed August 17, 2021. https://apps.bea.gov/iTable/iTable.cfm?reqid=70&step=30&isuri=1&tableid=-21&state=0&area=xx&year=2018,2017,2016,2015,2014&yearbegin=-1&13=70&area_type=0&11=-1&12=levels&3=non-industry&2=7&category=421&10=-1&1=20&0=720&year_end=-1&7=3&6=-1&5=xx,19000&4=4&classification=non-industry&9=19000&unit_of_measure=levels&8=20&statistic=3&major_area=0
36. Iowa Community Indicators Program. Urban percentage of the population for states, historical. 2010. Accessed August 17, 2021. https://www.icip.iastate.edu/tables/population/urban-pct-states
37. GitHub, Inc. *The New York Times* COVID-19-data. Accessed August 18, 2021. https://github.com/nytimes/covid-19-data/blob/master/us-states.csv
38. American Dental Association. COVID-19 economic impact—state dashboard. Accessed May 23, 2021. https://www.ada.org/en/science-research/health-policy-institute/covid-19-dentists-economic-impact/survey-results
39. Shanafelt T, Ripp J, Trockel M. Understanding and addressing sources of anxiety among health care professionals during the COVID-19 pandemic. *JAMA*. 2020;323(21):2133-2134. doi:10.1001/jama.2020.5893
40. Pappa S, Ntella V, Giannakas T, Giannakoulis VG, Papoutsi E, Katsaounou P. Prevalence of depression, anxiety, and insomnia among healthcare workers during the COVID-19 pandemic: a systematic review and meta-analysis. *Brain Behav Immun*. 2020;88:901-907. doi:10.1016/j.bbi.2020.05.026
41. The Commonwealth Fund. The impact of COVID-19 on outpatient visits in 2020: visits remained stable, despite a late surge in cases. February 22, 2021. Accessed May 27, 2021. https://www.commonwealthfund.org/publications/2021/feb/impact-covid-19-outpatient-visits-2020-visits-stable-despite-late-surge
42. Song Z, Giuriato M, Lillehaugen T, et al. Economic and clinical impact of COVID-19 on provider practices in Massachusetts. *NEJM Catalyst*. 2020. doi:10.1056/CAT.20.0441
43. National Academy of Medicine. Valid and reliable survey instruments to measure burnout, well-being, and other work-related dimensions. Accessed May 26, 2021. https://nam.edu/valid-reliable-survey-instruments-measure-burnout-well-work-related-dimensions
44. Dyrbye LN, Satele D, Shanafelt T. Ability of a 9-item Well-Being Index to identify distress and stratify quality of life in US workers. *J Occup Environ Med*. 2016;58(8):810-817. doi:10.1097/JOM.0000000000000798
45. Dyrbye LN, Satele D, Sloan J, Shanafelt TD. Utility of a brief screening tool to identify physicians in distress. *J Gen Intern Med*. 2013;28(3):421-427. doi:10.1007/s11606-012-2252-9
46. Dyrbye LN, Johnson PO, Johnson LM, et al. Efficacy of the Well-Being Index to identify distress and stratify well-being in nurse practitioners and physician assistants. *J Am Assoc Nurse Pract*. 2019;31(7):403-412. doi:10.1097/JXX.0000000000000179
47. Weiss DJ, Dawis RV, England GW. Manual for Minnesota Satisfaction Questionnaire. *Minnesota Studies in Vocational Rehabilitation*. 1967;22:120.
48. Groves RM, Fowler FJ Jr, Couper MP, Lepkowski JM, Singer E, Tourangeau R. *Survey Methodology*. 2nd ed. John Wiley & Sons; 2009.
49. Rao JNK, Scott AJ. On simple adjustments to chi-square tests with sample survey data. *Ann Stat*. 1987;15(1):385-397. doi:10.1214/aos/1176350273
50. Benjamini Y, Hochberg Y. Controlling the false discovery rate: a practical and powerful approach to multiple testing. *J R Stat Soc Series B Stat Methodol*. 1995;57(1):289-300. doi:10.1111/j.2517-6161.1995.tb02031.x

51. Robert Graham Center. AAFP NRN/RGC COVID-19 survey reports. Accessed May 27, 2021. https://www.graham-center.org/rgc/publications-reports.html
52. New York University School of Global Health. COVID-19 impact on primary care in NYC. Wave 1 fielded April 10-23, 2020. Accessed May 27, 2021. https://nyu.app.box.com/s/bq85rpnm6qo87xbrpjp7l795t0odep4s
53. American Dental Association. Economic impact of COVID-19 on dental practices: results for public health dentists. Accessed May 25, 2021. https://www.ada.org/en/science-research/health-policy-institute/covid-19-dentists-economic-impact/public-health-results
54. US Department of Health and Human Services, Health Resources & Services Administration. Health center COVID-19 survey. Latest data from May 21, 2021. Accessed May 30, 2021. https://bphc.hrsa.gov/emergency-response/coronavirus-health-center-data
55. Magill E, Siegel Z, Pike KM. The mental health of frontline health care providers during pandemics: a rapid review of the literature. *Psychiatr Serv*. 2020;71(12):1260-1269. doi:10.1176/appi.ps.202000274
56. Tam CWC, Pang EPF, Lam LCW, Chiu HFK. Severe acute respiratory syndrome (SARS) in Hong Kong in 2003: stress and psychological impact among frontline healthcare workers. *Psychol Med*. 2004;34(7):1197-1204. doi:10.1017/s0033291704002247
57. Centers for Medicare & Medicaid Services. Federally Qualified Health Centers (FQHC) Center. COVID-19 public health emergency (PHE)—updates for FQHCs. Accessed May 23, 2021. https://www.cms.gov/Center/Provider-Type/Federally-Qualified-Health-Centers-FQHC-Center
58. Centers for Medicare & Medicaid Services. New & expanded flexibilities for RHCs & FQHCs during the COVID-19 PHE. MLN Matters SE20016. February 23, 2021. Accessed May 23, 2021. https://www.cms.gov/files/document/se20016.pdf
59. Congressional Research Service. Federal health centers and COVID-19. April 30, 2020. Accessed May 23, 2021. https://crsreports.congress.gov/product/pdf/IN/IN11367
60. Indian Health Service. IHS COVID-19 promotion materials. Accessed September 21, 2021. https://www.ihs.gov/coronavirus/resources
61. Rangachari P, Woods JL. Preserving organizational resilience, patient safety, and staff retention during COVID-19 requires a holistic consideration of the psychological safety of healthcare workers. *Int J Environ Res Public Health*. 2020;17(12):4267. doi:10.3390/ijerph17124267
62. Maunder RG, Lancee WJ, Balderson KE, et al. Long-term psychological and occupational effects of providing hospital healthcare during SARS outbreak. *Emerg Infect Dis*. 2006;12(12):1924-1932. doi:10.3201/eid1212.060584
63. Carmassi C, Foghi C, Dell'Oste V, et al. PTSD symptoms in healthcare workers facing the three coronavirus outbreaks: what can we expect after the COVID-19 pandemic. *Psychiatry Res*. 2020;292:113312. doi:10.1016/j.psychres.2020.113312
64. Yuan K, Gong YM, Liu L, et al. Prevalence of posttraumatic stress disorder after infectious disease pandemics in the twenty-first century, including COVID-19: a meta-analysis and systematic review (online February 4, 2021). *Mol Psychiatry*. doi:10.1038/s41380-021-01036-x
65. Shanafelt TD, Mungo M, Schmitgen J, et al. Longitudinal study evaluating the association between physician burnout and changes in professional work effort. *Mayo Clin Proc*. 2016;91(4):422-431. doi:10.1016/j.mayocp.2016.02.001
66. Hamidi MS, Bohman B, Sandborg C, et al. Estimating institutional physician turnover attributable to self-reported burnout and associated financial burden: a case study. *BMC Health Serv Res*. 2018;18(1):851. doi:10.1186/s12913-018-3663-z
67. Windover AK, Martinez K, Mercer MB, Neuendorf K, Boissy A, Rothberg MB. Correlates and outcomes of physician burnout within a large academic medical center. *JAMA Intern Med*. 2018;178(6):856-858. doi:10.1001/jamainternmed.2018.0019
68. Muller AE, Hafstad EV, Himmels JPW, et al. The mental health impact of the COVID-19 pandemic on healthcare workers, and interventions to help them: a rapid systematic review. *Psychiatry Res*. 2020;293:113441. doi:10.1016/j.psychres.2020.113441
69. Serrano-Ripoll MJ, Meneses-Echavez JF, Ricci-Cabello I, et al. Impact of viral epidemic outbreaks on mental health of healthcare workers: a rapid systematic review and meta-analysis. *J Affect Disord*. 2020;277:347-357. doi:10.1016/j.jad.2020.08.034
70. Hooper JJ, Saulsman L, Hall T, Waters F. Addressing the psychological impact of COVID-19 on healthcare workers: learning from a systematic review of early interventions for frontline responders. *BMJ Open*. 2021;11(5):e044134. doi:10.1136/bmjopen-2020-044134
71. Jun J, Tucker S, Melnyk BM. Clinician mental health and well-being during global healthcare crises: evidence learned from prior epidemics for COVID-19 pandemic. *Worldviews Evid Based Nurs*. 2020;17(3):182-184. doi:10.1111/wvn.12439
72. The Physicians Foundation. 2021 Survey of America's Physicians. COVID-19 impact edition: a year later. August 4, 2021. Accessed August 18, 2021. https://physiciansfoundation.org/physician-and-patient-surveys/the-physicians-foundation-2021-physician-survey/?utm_source=email&utm_medium=newsletter&utm_campaign=PF_Survey_2021&utm_content=Email
73. Lou NM, Montreuil T, Feldman LS, et al. Evaluations of healthcare providers' perceived support from personal, hospital, and system resources: implications for well-being and management in healthcare in Montreal, Quebec, during COVID-19. *Eval Health Prof*. 2021;44(3):319-322. doi:10.1177/0163278721101274
74. Maunder RG, Leszcz M, Savage D, et al. Applying the lessons of SARS to pandemic influenza: an evidence-based approach to mitigating the stress experienced by healthcare workers. *Can J Public Health*. 2008;99(6):486-488. doi:10.1007/BF03403782
75. Johnson TP, Audibert C, Glass D. Method and transparency of online physician surveys: an overview (online May 3, 2020). *Survey Methods: Insights From the Field*. doi:10.13094/SMIF-2020-00001
76. McLeod CC, Klabunde CN, Willis GB, Stark D. Health care provider surveys in the United States, 2000-2010: a review. *Eval Health Prof*. 2013;36(1):106-126. doi:10.1177/0163278712474001
77. Pathman DE, Konrad TR, Sewell RG, Fannell J, Rauner T. Satisfaction of the primary care, mental health, and dental

health clinicians of the National Health Service Corps Loan Repayment Program. *J Health Care Poor Underserved*. 2019;30(3):1197-1211. doi:10.1353/hpu.2019.0082

78. Sharac J, Morris R, Casoni M, Jacobs F, Shin P. Community health center accomplishments and challenges, one year in to the COVID-19 pandemic. Policy Brief #65. Geiger Gibson/RCHN Community Health Collaborative. April 2021. Accessed August 18, 2021. https://www.rchnfoundation.org/wp-content/uploads/2021/04/FINAL-GG-RCHN-IB-65-April-2021.pdf
79. Centers for Disease Control and Prevention. Strategies to mitigate healthcare personnel staffing shortages. Updated March 10, 2021. Accessed May 30, 2021. https://www.cdc.gov/coronavirus/2019-ncov/hcp/mitigating-staff-shortages.html